

Application No. 10/786,547
Amendment dated December 28, 2005
Reply to Office Action of September 30, 2005

Docket No.: 21994-00067-US

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A magnetron sputtering apparatus comprising:

a vacuum chamber;

a target;

a cathode holding the target in the vacuum chamber;

a substrate;

an anode holding the substrate and being ~~allocated~~ located above the cathode so as to face the substrate toward the target on the cathode;

a permanent magnet assembly generating a magnetic field and being ~~allocated~~ located under the cathode; and

a rotation controller rotating the permanent magnet assembly around an axis ~~so as to pivot with rotation occurring on almost~~ a center of the target as the axis,

the permanent magnet assembly further comprising:

a base;

a first permanent magnet being fixed on the base in the middle; and

a second permanent magnet in a ring shape being fixed in a peripheral area of the base so as to surround the first permanent magnet,

wherein a magnetic polarity of the second permanent magnet is inverse with respect to a magnetic polarity of the first permanent magnet, and

wherein magnetic field strength of the second permanent magnet is weaker than magnetic field strength of the first permanent magnet, and

wherein the permanent magnet assembly is formed such that a plane constituted by a top surface of the first permanent magnet and another top surface of the second permanent magnet is slanted with respect to a surface of the target in a cylindrical shape of which top portion is cut diagonally,

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~~the magnetron sputtering apparatus is characterized in that the permanent magnet is perpendicularly allocated on a top of the axis of rotation of the rotation controller.~~

2. (Currently amended) The magnetron sputtering apparatus in accordance with claim 1, wherein the first permanent magnet is fixed on a middle of the base in the middle with shifting wherein a center axis of the first permanent magnet is shifted eccentrically with respect to ~~a the~~ center of rotation of the permanent magnet assembly, and
~~wherein the permanent magnet is either in a cylindrical shape of which top portion is cut diagonally or in a shape having different heights of which height steps down gradually from one end to the other.~~

3. (Currently amended) ~~The A~~ magnetron sputtering apparatus in accordance with claim ~~1,~~ comprising:

a vacuum chamber;

a target;

a cathode holding the target in the vacuum chamber;

a substrate;

an anode holding the substrate and being located above the cathode so as to face the substrate toward the target on the cathode;

a permanent magnet assembly generating magnetic field and being located under the cathode; and

a rotation controller rotating the permanent magnet assembly around an axis with rotation occurring on a center of the target as the axis.

the permanent magnet assembly further comprising:

a base;

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a first permanent magnet being fixed on a middle of the base in the middle with shifting wherein a center axis of the first permanent magnet is shifted eccentrically with respect to a the center of rotation of the permanent magnet assembly; and

a second permanent magnet in a ring shape being fixed in a peripheral area of the base so as to surround the first permanent magnet[.];

wherein a magnetic polarity of the second permanent magnet is inverse with respect to a magnetic polarity of the first permanent magnet[.]; and

wherein magnetic field strength of the second permanent magnet is weaker than magnetic field strength of the first permanent magnet; and
~~— wherein top surfaces of the first and second permanent magnets are made to be flat horizontally and in parallel with the base respectively.~~

4. (Currently amended) The magnetron sputtering apparatus in accordance with claim 1, further comprising:

a wedge shaped member having a predetermined slant angle being located between the rotation controller and the permanent magnet assembly; and

wherein a top surface of the member contacting a bottom surface of the base is slanted with respect to the target

~~wherein the permanent magnet is shaped into that top surfaces of the first and second permanent magnets are made to be flat horizontally and in parallel with the base respectively;~~

~~— the magnetron sputtering apparatus is characterized in that the permanent magnet is allocated on a top of the axis of rotation of the rotation controller on a slant with respect to the axis of rotation of the rotation controller.~~

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5. (Currently amended) The magnetron sputtering apparatus in accordance with claim 1
2. further comprising:

a wedge shaped member having a predetermined slant angle being located between
the rotation controller and the permanent magnet assembly; and
wherein a top surface of the member contacting a bottom surface of the base is slanted
with respect to the target

~~wherein the first permanent magnet is fixed on the base in the middle with shifting a~~
~~center axis of the first permanent magnet eccentrically with respect to a center of rotation~~
~~of the permanent magnet; and~~

~~wherein the permanent magnet is shaped into that top surfaces of the first and second~~
~~permanent magnets are made to be flat horizontally and in parallel with the base~~
~~respectively;~~

~~the magnetron sputtering apparatus is characterized in that the permanent magnet is~~
~~allocated on a top of the axis of rotation of the rotation controller on a slant with respect~~
~~to the axis of rotation of the rotation controller.~~

6. (Currently amended) A magnetron sputtering apparatus comprising:

a vacuum chamber;

a target;

a cathode holding the target in the vacuum chamber;

a substrate;

an anode holding the substrate and being ~~allocated~~ located above the cathode so as to
face the substrate toward the target on the cathode; and

a permanent magnet assembly generating magnetic field and being ~~allocated~~ located
under the cathode[.,,];

the permanent magnet assembly further comprising:

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a first permanent magnet provided with a sliding mechanism for sliding the first permanent magnet horizontally with respect to the target, being ~~allocated~~ located in the middle of the ~~target base~~; and

a second permanent magnet being fixed in a peripheral area of the ~~target base~~;[[,]]

wherein ~~a magnetic polarity~~ the N-pole of the second ~~first~~ permanent magnet is ~~inverse with respect to a magnetic polarity~~ faces toward the target and the S-pole of the first ~~second~~ permanent magnet faces toward the target;[[,]] and

wherein magnetic field strength of the second permanent magnet is weaker than magnetic field strength of the first permanent magnet, ~~and~~
~~wherein a top surface of the second permanent magnet is in parallel with a top surface of the first permanent magnet.~~